

Amendments to Claims:

This listing of Claims will replace all prior versions, and listings, of Claims in the application.

Listing of Claims

Claims 1-22 (canceled)

Claim 23. (previously presented) A heat pump air conditioning system for controlling the temperature and humidity of supply air to an enclosed space, said system comprising:

a refrigerant fluid circuit including a flow direction reversing valve, a compressor operable to conduct compressed refrigerant fluid vapor to a condenser heat exchanger, a reheat heat exchanger and an evaporator heat exchanger for circulating refrigerant fluid therethrough;

a supply air blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to said enclosed space;

a fluid expansion control device disposed in said circuit between said condenser heat exchanger and said evaporator heat exchanger;

a first control valve disposed in said circuit between said expansion device and said condenser heat exchanger for selectively directing flow of refrigerant fluid to said evaporator heat exchanger or said reheat heat exchanger;

a second control valve disposed in said circuit for selectively directing flow of refrigerant fluid from said reheat heat exchanger to a conduit in communication with said expansion device or from said reheat heat exchanger to a conduit extending between said evaporator heat exchanger and said reversing valve;

temperature and humidity sensors for sensing the temperature and humidity of air in said enclosed space; and

a controller operably connected to said sensors, said control valves and said reversing valve and operable for causing refrigerant fluid flow through said circuit in one operating condition of said control valves directly from said condenser heat exchanger through said evaporator heat exchanger and in another operating condition of said control valves from said condenser heat exchanger through said reheat heat exchanger and then through said evaporator heat exchanger.

Claim 24. (previously presented) The system set forth in Claim 23 including:

a bypass conduit in said circuit for bypassing refrigerant fluid around said condenser heat exchanger to a conduit of said circuit connected to said first control valve.

Claim 25. (previously presented) The system set forth in Claim 24 including:

a pressure relief valve disposed in said bypass conduit for controlling refrigerant fluid pressure at which fluid bypasses said condenser heat exchanger.

Claim 26. (previously presented) The system set forth in Claim 23 including:

a fluid expansion device disposed in said circuit between said first control valve and said condenser heat exchanger for throttling flow of refrigerant fluid during operation of said system as a heat pump.

Claim 27. (previously presented) The system set forth in Claim 23 including:

a refrigerant fluid charge compensator operably connected to said circuit for storing a portion of said refrigerant fluid.

Claim 28. (previously presented) The system set forth in Claim 27 wherein:

said refrigerant fluid charge compensator comprises a heat exchanger disposed in said circuit between said evaporator heat exchanger and said reversing valve and in fluid flow communication with refrigerant fluid in said reheat heat exchanger.

Claim 29. (previously presented) The system set forth in Claim 23 including:

means for controlling flow of a heat exchange medium in contact with said condenser heat exchanger for varying heat exchange with refrigerant fluid flowing through said condenser heat exchanger.

Claim 30. (previously presented) The system set forth in Claim 29 wherein:

said heat exchange medium is ambient air and said means for controlling is a variable speed fan.

Claim 31. (previously presented) A heat pump air conditioning system for controlling the temperature and humidity of supply air to an enclosed space, said system comprising:

a refrigerant fluid circuit including a flow direction reversing valve, a compressor operable to conduct compressed refrigerant fluid vapor to a condenser heat exchanger, a reheat heat exchanger and an evaporator heat exchanger for circulating refrigerant fluid therethrough;

a supply air blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to said enclosed space;

a fluid expansion control device disposed in said circuit between said condenser heat exchanger and said evaporator heat exchanger;

a control valve disposed in said fluid circuit between said expansion device and said condenser heat exchanger for selectively directing flow of refrigerant fluid to said evaporator heat exchanger or said reheat heat exchanger;

a refrigerant fluid charge compensator operably connected to said circuit for storing a portion of said refrigerant fluid;

temperature and humidity sensors for sensing the temperature and humidity of air in said enclosed space; and

a controller operably connected to said sensors, said control valve and said reversing valve and operable for causing refrigerant fluid flow through said circuit in one operating condition of said control valve directly from said condenser heat exchanger through said evaporator heat exchanger and in another operating condition of said control valve from said condenser heat exchanger through said reheat heat exchanger and then through said evaporator heat exchanger.

Claim 32. (previously presented) The system set forth in Claim 31 including:

a bypass conduit in said circuit for bypassing refrigerant fluid around said condenser heat exchanger to a conduit of said circuit connected to said control valve.

Claim 33. (previously presented) The system set forth in Claim 32 including:

a pressure relief valve disposed in said bypass conduit for controlling refrigerant fluid pressure at which fluid bypasses said condenser heat exchanger.

Claim 34. (previously presented) The system set forth in Claim 31 including:

a fluid expansion device disposed in said circuit between said control valve and said condenser heat exchanger for throttling flow of refrigerant fluid during operation of said system as a heat pump.

Claim 35. (previously presented) The system set forth in Claim 31 wherein:

said refrigerant fluid charge compensator comprises a heat exchanger disposed in said circuit between said evaporator heat exchanger and said reversing valve and in fluid flow communication with refrigerant fluid in said reheat heat exchanger.

Claim 36. (new) An air conditioning system for conditioning supply air conducted to an enclosed space comprising:

a refrigerant fluid circuit including a condenser heat exchanger and an evaporator heat exchanger operably connected for circulating a refrigerant fluid;

a supply air reheat heat exchanger disposed downstream of said evaporator heat exchanger with respect to the direction of supply air flow through said evaporator heat exchanger and said reheat heat exchanger;

a control valve for selectively controlling refrigerant fluid to flow directly from said condenser heat exchanger to said evaporator heat exchanger and from said condenser heat exchanger to said reheat heat exchanger and then to said evaporator heat exchanger;

a blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to supply conditioned air to said space;

a humidity sensor for sensing the humidity in said enclosed space; and

a controller for controlling flow of heat exchange medium through said condenser heat exchanger whereby dehumidification of supply air flowing to said enclosed space may be controlled by the amount of heat exchange carried out by said reheat heat exchanger and said condenser heat exchanger, respectively.

Claim 37. (new) The system set forth in Claim 36 wherein:
said refrigerant fluid circuit includes a compressor for compressing refrigerant fluid discharged from said evaporator heat exchanger and for conduction to said condenser heat exchanger.

Claim 38. (new) The system set forth in Claim 36 wherein:
said heat exchange medium comprises air and said system includes a fan disposed for propelling air through said condenser heat exchanger.

Claim 39. (new) The system set forth in Claim 38 wherein:
said fan is driven at variable speed by a motor operably connected to said controller.

Claim 40. (new) The system set forth in Claim 36 including:

a damper for controlling the flow of supply air to provide for bypassing at least a portion of supply air around said evaporator heat exchanger and said reheat heat exchanger.

Claim 41. (new) The system set forth in Claim 40 including:

an actuator connected to said damper and to said controller for selectively controlling the amount of supply air flowing through said system to bypass said evaporator heat exchanger and said reheat heat exchanger.

Claim 42. (new) The system set forth in Claim 36 wherein:
said refrigerant circuit includes a flow reversing valve disposed between a compressor for compressing said refrigerant fluid, said condenser heat exchanger and said evaporator heat exchanger for selectively operating said system for cooling and dehumidifying said supply air and for heating said supply air, depending on the position of said reversing valve.

Claim 43. (new) The system set forth in Claim 36 including:

a further control valve in said refrigerant fluid circuit for controlling flow of refrigerant fluid from said reheat heat exchanger wherein in a first mode of operation of said system for cooling supply air flowing through said evaporator heat exchanger refrigerant fluid bypasses said reheat heat exchanger, and in a second mode of operation of said system for cooling and dehumidifying supply air refrigerant fluid is circulated from said condenser heat exchanger through said reheat heat exchanger and then through said evaporator heat exchanger.

Claim 44. (new) The system set forth in Claim 43 wherein:
said refrigerant fluid circuit includes a flow direction reversing valve and in a third mode of operation refrigerant fluid flows through said evaporator heat exchanger, then through said reheat heat exchanger and then through said condenser heat exchanger.

Claim 45. (new) An air conditioning system for conditioning supply air conducted to an enclosed space comprising:

a refrigerant fluid circuit including a condenser heat exchanger and an evaporator heat exchanger operably connected for circulating a refrigerant fluid;

a supply air reheat heat exchanger disposed downstream of said evaporator heat exchanger with respect to the direction of supply air flow through said evaporator heat exchanger and said reheat heat exchanger;

a blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to supply conditioned air to said space;

a humidity sensor for sensing the humidity in said enclosed space;

a controller for controlling flow of heat exchange medium through said condenser heat exchanger whereby dehumidification of supply air flowing to said enclosed space may be controlled by the amount of heat exchange carried out by said reheat heat exchanger and said condenser heat exchanger, respectively; and

a bypass conduit for bypassing refrigerant fluid in said circuit around said condenser heat exchanger when fluid flow restriction increases as reduced heat exchange takes place therein between said refrigerant fluid and said heat exchange medium.

Claim 46. (new) The system set forth in Claim 45 including:

a pressure relief valve disposed in said bypass conduit for controlling refrigerant fluid pressure at which refrigerant fluid bypasses said condenser heat exchanger.

Claim 47. (new) An air conditioning system for conditioning supply air conducted to an enclosed space comprising:

a refrigerant fluid circuit including a condenser heat exchanger and an evaporator heat exchanger operably connected for circulating a refrigerant fluid;

a supply air reheat heat exchanger disposed downstream of said evaporator heat exchanger with respect to the direction of supply air flow through said evaporator heat exchanger and said reheat heat exchanger;

a further heat exchanger disposed in said refrigerant fluid circuit between said condenser heat exchanger and said evaporator heat exchanger;

a blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to supply conditioned air to said space;

a humidity sensor for sensing the humidity in said enclosed space;

said reheat heat exchanger is in circuit with said further heat exchanger for circulating a fluid therebetween to effect reheat of supply air to control humidity in said space; and

a controller for controlling flow of heat exchange medium through said condenser heat exchanger whereby dehumidification of supply air flowing to said enclosed space may be controlled by the amount of heat exchange carried out by said reheat heat exchanger and said condenser heat exchanger, respectively.

Claim 48. (new) An air conditioning system for conditioning supply air conducted to an enclosed space comprising:

a refrigerant fluid circuit including a condenser heat exchanger and an evaporator heat exchanger operably connected for circulating a refrigerant fluid;

a supply air reheat heat exchanger disposed downstream of said evaporator heat exchanger with respect to the direction of supply air flow through said evaporator heat exchanger and said reheat heat exchanger;

a refrigerant fluid charge compensator operably connected to said refrigerant fluid circuit for storing a portion of said refrigerant fluid;

a blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to supply conditioned air to said space;

a humidity sensor for sensing the humidity in said enclosed space; and

a controller for controlling flow of heat exchange medium through said condenser heat exchanger whereby dehumidification of supply air flowing to said enclosed space may be controlled by the amount of heat exchange carried out by said reheat heat exchanger and said condenser heat exchanger, respectively.

Claim 49. (new) An air conditioning system for controlling the temperature and humidity of supply air furnished to an enclosed space, said system comprising:

a refrigerant fluid circuit including a compressor operable to compress refrigerant fluid vapor and operable to be connected to a condenser heat exchanger, a reheat heat exchanger and an evaporator heat exchanger for circulating refrigerant fluid therethrough;

a supply air blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to said enclosed space;

a fan for conducting a controlled amount of ambient outdoor air over said condenser heat exchanger;

a fan motor drivably connected to said fan for controlling the flow of air over said condenser heat exchanger;

control valves for selectively controlling flow of refrigerant fluid through said reheat heat exchanger;

temperature and humidity sensors for sensing the temperature and humidity of air in said enclosed space;

a controller operably connected to said compressor and said fan for causing refrigerant fluid to flow through said condenser heat exchanger and said evaporator heat exchanger, for actuating said control valves to selectively control flow of refrigerant fluid through said reheat heat exchanger and for controlling flow of air over said condenser heat exchanger to selectively control the temperature and humidity in said enclosed space; and

said compressor, said condenser heat exchanger, said fan and said fan motor comprise an outdoor portion of said system and said system may be provided by replacing an indoor portion of a prior system without replacing, adding or deleting a portion of said refrigerant fluid circuit that extends between an indoor portion of said system and said outdoor portion of said system.

Claim 50. (new) An air conditioning system for conditioning supply air conducted to an enclosed space comprising:

a refrigerant fluid circuit including a condenser heat exchanger and an evaporator heat exchanger operably connected for circulating a refrigerant fluid;

a supply air reheat heat exchanger disposed downstream of said evaporator heat exchanger with respect to the direction of supply air flow through said evaporator heat exchanger and said reheat heat exchanger;

a control valve for selectively controlling refrigerant fluid to flow directly from said condenser heat exchanger to said evaporator heat exchanger and from said condenser heat exchanger to said reheat heat exchanger and then to said evaporator heat exchanger;

a blower for conducting supply air through said system including through said evaporator heat exchanger and then through said reheat heat exchanger to supply conditioned air to said space;

a damper disposed downstream of said blower in the direction of flow of supply air through said system and operable for controlling the flow of at least a portion of said supply air to bypass said evaporator heat exchanger and said reheat heat exchanger; and

a controller operably connected to an actuator for said damper for selectively controlling the amount of supply air to bypass said evaporator heat exchanger and said reheat heat exchanger.

Claim 51. (new) An air conditioning system for conditioning supply air conducted to an enclosed space comprising:

- a refrigerant fluid circuit including a condenser heat exchanger and an evaporator heat exchanger operably connected for circulating a refrigerant fluid;

- a supply air reheat heat exchanger disposed downstream of said evaporator heat exchanger with respect to the direction of supply air flow through said evaporator heat exchanger and said reheat heat exchanger;

- a further heat exchanger disposed in said refrigerant fluid circuit between said condenser heat exchanger and said evaporator heat exchanger;

- a blower for conducting supply air through said evaporator heat exchanger and said reheat heat exchanger to supply conditioned air to said space;

- a humidity sensor for sensing the humidity in said enclosed space;

- said reheat heat exchanger is connected in a heat exchange fluid circuit with said further heat exchanger for circulating a heat exchange fluid therebetween to effect reheat of supply air to control humidity in said space;

- a control valve interposed in said heat exchange fluid circuit; and

- a controller for actuating said control valve to control the flow of said heat exchange fluid whereby dehumidification of supply air flowing to said enclosed space may be controlled by the amount of heat exchange carried out by said reheat heat exchanger and said evaporator heat exchanger, respectively.